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# Microprocessors and Applications

## Lecture-5

## Addressing Modes in 8085

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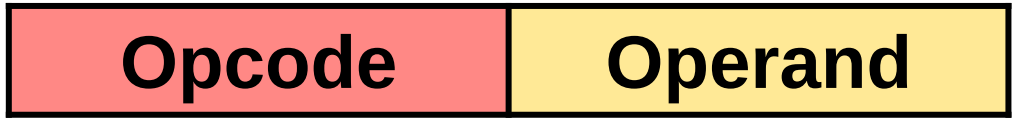
# INSTRUCTION FORMAT




- Each instruction (instruction format) is divided into two fields:
  - ✓ **Opcode:** Operation Code, which specifies the task to be performed.
  - ✓ **Operand:** The data on which operation is to be performed.
- The operands or data can be specified in different ways:
- Internal Register
- It may include an 8-bit or 16-bit data
- 8-bit or 16-bit address
- In some instructions, the operand is implicit.

# ADDRESSING MODES OF 8085

- The way of specifying data to be operated by an instruction is called addressing mode.
- Types of addressing modes –In 8085 microprocessor there are 5 types of addressing modes:

  a) Immediate Addressing Mode

  b) Register Addressing Mode

  c) Direct Addressing Mode

  d) Indirect Addressing Mode

  e) Implied/Implicit Addressing Mode

# ADDRESSING MODES OF 8085

## 1. Immediate Addressing Mode

In immediate addressing mode the source operand is always data. If the data is 8-bit, then the instruction will be of 2 bytes, if the data is of 16-bit then the instruction will be of 3 bytes.

**Examples:**

- **MVI B, 45** (move the data 45H immediately to register B)
- **LXI H, 3050** (load the H-L register pair with the 16-bit data- 3050H immediately)

# ADDRESSING MODES OF 8085

## 2. Register Addressing Mode

In register addressing mode, the data to be operated is available inside the register(s) and register(s) is(are) operands. Therefore the operation is performed within various registers of the microprocessor.

- **Examples:**
- **MOV A, B** (move the contents of register B to register A)
- **ADD B** (add contents of registers A and B and store the result in register A)
- **INR A** (increment the contents of register A by one)

# ADDRESSING MODES OF 8085

## 3. Direct Addressing Mode:

In direct addressing mode, the data to be operated is available inside a memory location and that memory location is directly specified as an operand. The operand is directly available in the instruction itself.

**Examples:**

- **LDA 2050** (load the contents of memory location into accumulator A)
- **STA 3000** (store the contents of accumulator at specified location)
- **IN 35** (read the data from port with specified address (35H) into accumulator)

# ADDRESSING MODES OF 8085

## 4. Indirect Addressing Mode:

In indirect addressing mode, the data to be operated is available inside a memory location and that memory location is indirectly specified b a register pair.

- **Examples:**
- **MOV A, M** (move the contents of the memory location pointed by the HL pair to the accumulator)
- **LDAX B** (move the contents of the memory location pointed by the BC pair to the accumulator)

# ADDRESSING MODES OF 8085

## 5. Implied/Implicit Addressing Mode

In implied/implicit addressing mode the operand is hidden and the data to be operated is available in the instruction itself.

- **Examples:**
- **CMA** (finds and stores the 1's complement of the contents of accumulator)
- **RRC** (rotate accumulator contents right by one bit)
- **RLC** (rotate accumulator contents left by one bit)

# CLASSIFICATION OF INSTRUCTIONS

1. Based on Instruction Word length
   a) One Byte Instructions
   b) Two Byte Instructions
   c) Three Byte Instructions

2. Based on Functionality
   a) Data Transfer Instruction
   b) Arithmetic Instructions
   c) Logical Instructions
   d) Branching Instructions
   e) Control Instructions

## ▪One-Byte Instructions:

One byte instruction include the opcode and the operand in the 8 bits only which is one byte.

| | | |
|---|---|---|
| Ex1. | MOV C, A | Hex code = 4F H (one byte) |
| Ex2. | ADD B | Hex code = 80 H (one byte) |
| Ex3. | CMA | Hex code = 2F H (one byte) |

## ▪Two-Byte Instructions

The two byte instruction is one which contains an 8-bit op-code and 8-bit operand (Data).

| | | |
|---|---|---|
| Ex1. | MVI A, 09 H | Hex code = 3E, 09 (two bytes) |
| Ex2. | ADI 07 H | Hex code = C6, 07 (two bytes) |
| Ex3. | IN 40 H | Hex code = DB, 40 (two bytes) |

## ▪Three-Byte instructions

In a three byte instruction the first byte is opcode and second and third bytes are operands i.e. 16-bit data or 16-bit address.

| | | |
|---|---|---|
| Ex1. | LDA 8509 H | Hex code = 3A, 09, 85 (Three bytes) |
| Ex2. | LXI H, 2500 H | Hex code = 21, 00, 25 (Three bytes) |
| Ex3. | STA 2600 H | Hex code = 32, 00, 26 (Three bytes) |